

## **APPENDIX "A"**

### **CEMENT CONCRETE FOR STREET, CURB AND GUTTER, SIDEWALK AND DRIVEWAY CONSTRUCTION.**

The work covered by these specifications consists of furnishing all labor, equipment, and materials, and performing all operations in connection with the construction of air-entrained Portland Cement concrete pavement in accord with these specifications and the applicable Improvement Drawings.

The cement concrete pavement work shall consist of a single course of cement concrete, including reinforcement and longitudinal and transverse joints, where required, constructed on a prepared subgrade in general conformity with the lines, grades and cross-sections shown on the plans.

The data included herewith is based upon general soil conditions which exist in the area. These general soil conditions, representing approximately 75 percent of the soils in the area, are clayey overburden soils, described as lean to moderately plastic silty clays, classified according to the Unified Soil Classification System as CL soils. Any site which is made up of soils substantially different would be evaluated independently by a Qualified Recognized Geotechnical Engineers. This work should consist of drilling, testing, and an engineering evaluation of all field and laboratory data, in light of the proposed design. Example of substantially different soil conditions are the very silty clays or clayey silts along the floodplain of the Licking River.

#### **ITEM 1.0 GRADING**

This term shall consist of all grading above or below subgrade elevations of whatever nature required to bring the street to proper subgrade elevations, including: necessary excavation for curb, gutter, sidewalk, construction of embankments, excavation and proper sloping of all cuts, and other work incidental thereto.

**1.1 EXCAVATIONS:** All excavations shall be made to approximate grade or subgrade elevations consistent with approved plans. Excavations shall not be steeper than a cut slope of 2.5 horizontal to 1 vertical.

**1.2 EXCAVATION BELOW SUBGRADE:** Whenever excavations below subgrade elevation to remove spongy or unstable material, organic matter, or other materials is required, the contractor shall remove same and shall replace with compactable soils as per Item 1.3. The excavation can be backfilled with

soils that were removed, provided they are clean clayey soils free of organic matter and other deleterious material, aerated and dried to near optimum moisture content or clean clayey borrow soils that have moisture contents near optimum moisture content.

**1.3 CONSTRUCTION OF EMBANKMENT:** All surface vegetation and heavy root system shall be removed to eliminate all vegetation from the area upon which the embankment is to be constructed. Soils so removed shall not be used in construction of embankment. These materials shall be stockpiled and respread across scarified areas after the scarified areas have been brought to within inches of finished grade.

Embankments shall be constructed of approved soils to approximate subgrade elevation in shallow level layers, 6 to 8 inches, within two (2) percent of optimum moisture content on the dry side of the curve or within three (3) percent of optimum moisture content on the wet side of the curve, compacted with an appropriate type of compaction equipment to a density not less than 95 percent of maximum density, as determined by the standard Proctor moisture-density test (ASTM D698-78 or AASHTO T-99) or 87 percent of maximum density as determined by the modified Proctor moisture-density test (ASTM D1557-78 or AASHTO T-180). Embankments greater than ten (10) feet in height shall have soils below ten (10) feet compacted to 95 percent or 87 percent of maximum density, standard and modified Proctor, respectively. Except as otherwise approved by a Qualified/Recognized Geotechnical Engineer, all soils placed in areas directly impacting public improvements shall be constructed to slopes no steeper than 2.5 (horizontal) to 1 (vertical) and flatter where possible for ease of maintenance.

**1.4 BACKFILL:** Clayey soils or granular soils shall be used to backfill utility crossings beneath and within three (3) feet on either side of the pavement and compacted to the densities stated in Item 1.3. Under no conditions shall granular backfill be flushed with water to obtain compaction. Utilities which are parallel and within three (3) feet either side of the pavement shall be compacted.

**1.5 SUBGRADE:** The subgrade is defined as the top one (1) foot of the soil profile at finished grade prior to placing the pavement. This top one (1) foot of soil will consist of: (a) compacted fill placed for embankments as outlined in Item 1.3; (b) undisturbed soils in the transitional areas from cut to fill immediately below the topsoil; or (c) undisturbed soils at depths greater than 3 feet below the original ground surface in cut areas. The top one (1) foot of subgrade shall be compacted to 93 percent of maximum density as determined by the standard Proctor moisture-density test (ASTM D698-78 or AASHTO T-99) or 85 percent of maximum density as determined by the modified Proctor moisture-density test (ASTM D1557-78 or AASHTO T-180) within three (3) percent of optimum

moisture content on the dry side of the curve or four (4) percent of optimum moisture content on the wet side of the curve immediately prior to placing the pavement. This specification is similar but not exactly the same to the compaction requirements in compacted fill areas since the embankment shall be compacted to 95 percent or 87 percent of maximum density as determined by the standard Proctor or modified Proctor moisture-density test, respectively. In transitional areas from cut to fill, the soils have been subject to seasonal changes of freezing and thawing and wetting and drying. These soils will exist at moisture contents well above optimum moisture content and at densities on the order of 60 to 80 percent of maximum density (ASTM D698-78). These soils shall be scarified, aerated, and dried in order to obtain the specified percent compaction for sub-grade. Soils in cut areas, three (3) feet below original grade, will exist at moisture contents above optimum moisture content and at densities on the order of 90 percent of maximum density (ASTM D698-78). These soils shall be scarified, aerated, and dried in order to obtain the specified percent compaction for subgrade.

Any soft or yielding areas, resulting from high moisture content that are encountered at the time of construction shall be scarified, aerated, and dried to reduce the moisture content nearer to optimum moisture content, then recompact to the specified density.

The subgrade shall be shaped to plan elevation and cross-section. Immediately prior to placing the concrete, the subgrade shall be checked for conformity with the cross-section shown on the plans by means of an approved template on the side forms. If necessary, the materials shall be removed or added, as required, to bring all portions of the subgrade to correct elevations. The subgrade shall be thoroughly compacted and again checked with the template. Concrete shall not be placed on any part of the subgrade which has not been checked for correct elevation. The subgrade shall be clean of loose or wet material prior to placing concrete.

Prior to placing the concrete, the Contractor shall proofroll the compacted subgrade with a piece of heavy rubber tired equipment, such as a roadgrader, loaded backhoe or a loaded single axle dump truck. The Inspector shall observe the proofrolling for consistency. Areas which are subject to excessive pumping or rutting shall be reworked and recompact as described above.

**1.6 EQUIPMENT FOR COMPACTION OF BACKFILL, EMBANKMENT, AND SUB-GRADE:** Any compaction equipment capable of producing the required embankment and subgrade densities, without lamination, will be permitted. Clayey type or cohesive soils shall be compacted with a kneading type compaction equipment, such as a sheepfoot roller. Cohesionless soils shall be

compacted with vibratory type equipment, such as a vibrating plate or roller. All compaction equipment shall be in good condition and shall be operated efficiently to assure uniform compaction.

1.7 SUBGRADE FOR SIDEWALKS AND DRIVEWAYS: Subgrade for driveways shall comply with Item 1.5. except soil density tests are not required. Cohesive soils or lean concrete shall be used under driveways (i.e., apron and sidewalk portion of driveway minimum eight (8) feet back of curb for single- or two-family or nine (9) feet for multi-family or commercial), provided compaction is performed per Item 1.6. For sidewalks between driveways subgrade of cohesive soils shall be uniformly compacted per Item 1.6. Cohesionless or granular soils may be used as a base on subgrade for sidewalks between driveways provided base thickness does not exceed four (4) inches or thickness equivalent to that of the sidewalk and compacted per Item 1.6

1.8 EQUIPMENT OPERATED ON STREETS: The contractor shall be permitted to operate only pneumatic tired equipment over any paved street surfaces and shall be responsible for correcting any damage to street surfaces resulting from the contractor's operation. Paved streets, adjacent to new development, shall have all loose soil or mud removed at the end of each day's work.

1.9 UTILITIES: Special precautions shall be taken by the contractor to avoid damage to existing overhead and underground utilities. Before proceeding with the work, the contractor shall confer with all public or private companies, agencies, or departments that own or operate utilities in the vicinity of the construction work. The contractor shall be diligent in his efforts to use every possible means to locate existing utilities.

1.10 SOIL DENSITY TESTS: Soil density tests, including moisture-density tests (ASTM D698-78 or ASTM D1557-78) and field density tests (ASTM D1556-64 or ASTM D2922-78) are required to determine the percent compaction in accord with the following:

- (1) Embankments - a minimum of one (1) test for each three (3) feet in elevation per 400 lineal feet or every 2500 cubic yards, or fraction thereof, of embankment section;
- (2) Utility backfill excavations for storm, sanitary sewer and water system crossings - a minimum of one (1) test for each two (2) feet in elevation per 100 lineal feet, or fraction thereof, of utility trench open cut beneath street subgrade and within three (3) feet outside of street pavements;
- (3) Subgrades - a minimum of one (1) test per 100 lineal feet for streets 500 lineal feet or less or one (1) test per 200 lineal feet for streets over 500 lineal feet at each of the following locations, where applicable:

- (a) compacted fill placed for embankments;
- (b) undisturbed soils in transitional areas from cut to fill immediately below the topsoil; and
- (c) undisturbed soils at depths greater than 3 feet below the original ground in cut areas.

Density tests of soil embankment, utility excavations, or subgrade are not applicable when at least one of the following conditions exist:

- (1) more than five (5) percent of the material contains greater than one (1) inch sieve size particles; or
- (2) more than 60 percent of the material contains greater than No. 4 sieve size particles except DGA (dense graded aggregate).

Proof of conditions (1) or (2) shall be performed by at least one (1) gradation test by a recognized testing laboratory and mailed directly to the inspector.

All soil density testing shall be at the expense of the developer. The results of these tests shall be mailed directly to the developer, design engineer, inspector, and the contractor. The results of all soil testing shall be compared to the densities, stated in Items 1.3, 1.4, 1.5, and 1.7 of these regulations. Any deficiencies found in construction work must be remedied in the field or resolved between the developer, contractor, and inspector, subject to approval by a qualified registered professional engineer.

## ITEM 2.0 MATERIALS

Concrete shall be composed of Portland Cement, air-entraining agent, aggregates, and water.

2.1 PORTLAND CEMENT: Cement of the type specified shall conform to requirements of the current ASTM specifications including Portland Cement Type I or Type III - High Early Strength (Designations C 150, C 175 or C 595). Cement, which for any reason has become partially set or which contains lumps of caked cement, shall be rejected. Either packaged or bulk cement may be used.

2.2 AIR-ENTRAINING AGENT: Air-entraining agents shall conform to the requirements of the current ASTM specifications for air-entraining admixtures for concrete (Designation C 260).

2.3 ADMIXTURES FOR CONCRETE: Chemical admixture of the type specified shall conform to requirements of the current ASTM specifications for Admixtures of Type A thru and Type E (Designation C 494). No pozzolans (Fly Ash) will be allowed as substitute for cement.

2.4 AGGREGATES: All aggregates for concrete shall meet the current standard requirements for concrete pavements of the Kentucky Department for Transportation, Bureau of Highways, or the current ASTM specification for concrete aggregates (Designation C 33).

Aggregates shall be so handled that moisture content and gradation are reasonably uniform and do not change appreciably from batch to batch or hour to hour.

No aggregates shall be used which have become contaminated or intermixed. Frozen aggregates or aggregates containing frozen lumps shall be thawed before use.

2.5 WATER: Water used in mixing or curing concrete shall be clean and free from injurious amounts of oil, acids, salt, alkali, or organic materials or other substances harmful to concrete. Normally, water from public supplies, which is suitable for drinking, is satisfactory.

2.6 REINFORCING STEEL: Reinforcing steel, if specified, shall conform to current Standard Specifications of the Kentucky Department of Transportation, Bureau of Highways.

2.7 JOINTS:

2.7.1 EXPANSION JOINTS: Expansion joints shall be non-extruding pre-formed joint fillers and shall conform to current Standard Specifications of the Kentucky Department of Transportation. The selection of the type will be at the contractor's option.

2.7.2 JOINT SEALING COMPOUND: The material used for filling and sealing cracks and/or joints shall be W. R. Meadows Sealtight #164 - Hot Pour Rubber Asphalt Sealer, W. R. Meadows Sealtight Hi-Spec Hot Pour Joint Sealing Compound or approved equal (AASHTO M 173).

### ITEM 3.0 BATCHING

Batching shall conform to Kentucky Department of Transportation, Bureau of Highways Specification 601.08 through 601.18.

3.1 STRENGTH OF CONCRETE: Finished concrete shall attain a minimum expected strength at 28 days of 4000 pounds per square inch compressive strength and/or 570 pounds per square inch flexural strength "modulus of rupture".

Except for sidewalks and driveways, at least two (2) test cylinders shall be made for each day's placement for each 100 cubic yards, or portion thereof, by a recognized testing laboratory. One (1) cylinder shall be broken at seven days and one (1) cylinders at 28 days. The results of these tests shall be sent directly to the Inspector, Design Engineer, Contractor, and concrete supplier.

The fabricating, curing, breaking, and reporting the test cylinders, slump test, and air content test shall be made at the contractor's expense.

3.2 PROPORTIONING CONCRETE: The proper proportions of cement, water, and aggregates shall be determined in accordance with ACI Standard 613, "Recommended Practice for Selecting Proportions for Concrete", or the Portland Cement Association booklet, "Design and Control of Concrete Mixtures", latest editions.

The entrained air shall be obtained by using an air-entraining agent. All concrete shall be air-entrained in accordance with the following:

MAXIMUM SIZE OF AGGREGATE (INCHES)	AIR CONTENT PERCENT BY VOLUME
1-1/2, 2, 2-1/2	5 + / - 1%
3/4, 1	6 + / - 1%
3/8, 1/2	7-1/2 + / - 1%

3.3 CONSISTENCY: The slump of the concrete shall not exceed four (4) inches. Consistency shall be measured as described in the current ASTM Standard Method of Slump Test for Consistency of Portland Cement Concrete (Designation C 143 or Method of Test for Ball Penetration for Portland Cement Concrete, Designation C-360).

3.4 READY-MIXED CONCRETE: All ready-mixed concrete shall be furnished in accordance with current ASTM specifications for ready-mixed concrete (Designation C 94 or AASHTO M 157). Any concrete, which is not plastic and workable when it reaches the subgrade, shall be rejected.

3.4.1 TIME OF DELIVERY: Concrete shall be delivered and discharged from a truck mixer or agitator truck within a period of one and one-half (1-1/2) hours at air temperatures up to eighty-five (85) degrees Fahrenheit, and one (1) hour at air temperatures higher than eighty-five (85) degrees Fahrenheit, after

introduction of the water to the cement and aggregates or the cement to the aggregates. Delivery tickets shall have this time clearly shown thereon, and the inspector shall check to be certain that delivery is made within the period specified.

**3.4.2 TYPE OF DELIVERY EQUIPMENT:** Concrete shall be delivered in truck mixers or agitator truck (i.e., trucks providing mechanical agitation by revolving drums or revolving blades in a stationary drum) operated after time required for thorough mixing of the concrete at the speed designated by the manufacturer as agitating speed.

**3.5 JOB-MIXED CONCRETE:** Job-mixed concrete shall be mixed in a drum mixer, which shall conform to the concrete paving mixer standards of the Mixer Manufacturers Bureau of the Association General Contractors of America. The mixer shall be capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified time and of discharging the material without segregation.

The entire contents of the drum shall be discharged before recharging. The volume of the mixed materials per batch shall not exceed the manufacturer's guaranteed capacity of the mixer.

**3.5.1 TIME OF MIXING:** The mixing of each batch shall continue for not less than one minute after all materials, except water, are in the mixer. The mixer shall rotate at the rate recommended by its manufacturer. The mixer shall be provided with a batch timing device which shall be subject to inspection and adjustment by the inspector.

**3.6 ADJUSTING SLUMP OF CONCRETE:** Measured amounts of water can be added. After adding water, an additional slump test must be made.

#### **ITEM 4.0 MEASURING AIR CONTENT**

The air content shall be measured in accordance with ASTM Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method (Designation C 231) or ASTM Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method (Designation C 173).

#### **ITEM 5.0 FORMS**

Except for slipform paving methods, fixed forms may be made of wood or metal and shall have a depth equal to or greater than the prescribed edge of thickness of the pavement. Each section or form shall be straight, free from bends or warps.



The method of connections between the form sections shall be such that the joint thus formed is tight and free from movement in any direction.

Forms shall be of such cross-sections and strength and so secured as to resist the pressure of the concrete when placed, and the impact and vibration of any equipment which they support without springing or settlement.

5.1 SETTING FORMS: The subgrade under the forms shall be compacted and shaped so that the form set shall provide the specified elevation. The supply of forms shall be sufficient to permit their remaining in place for sufficient time so, when removed, the concrete will not be displaced. All forms shall be cleaned and oiled each time they are used.

5.2 GRADE AND ALIGNMENT: The alignment and grade elevation of the forms shall be checked by the contractor immediately ahead of concrete placement and necessary corrections will be made. Any forms that have been disturbed or subgrade that has become unstable shall be corrected and forms reset and rechecked. Any variations in grade and alignment shall be subject to approval of the Design Engineer and Inspector prior to placing concrete.

#### ITEM 6.0 PLACING CONCRETE

The concrete shall be mixed in quantities required for immediate use and shall be deposited on the subgrade to the required depth and width of the construction lane in successive batches and in a continuous operation, without the use of intermediate forms or bulk-heads. The concrete shall be placed as uniformly as possible, in order to minimize the amount of additional spreading necessary. While being placed, the concrete shall be vibrated and compacted with suitable tools, so that the formation of voids or honeycomb pockets is prevented.

No concrete shall be placed around manholes or other structures until they have been brought to the required grade and alignment. Additional tamping and compaction will be required after raising manholes.

6.1 COLD WEATHER CONCRETING: Concrete may be placed when the air temperature in the shade and away from artificial heat is thirty-five (35) degrees Fahrenheit or higher. No concrete shall be placed upon frozen subgrade. However, if subgrade has been protected from freezing and concrete temperature is 50 degrees or higher, concrete may be placed until ambient temperature drops to 25 degrees. Concrete shall be protected from freezing for a period up to three (3) days or until concrete reaches a compressive strength of 500 psi.

6.2 HOT WEATHER CONCRETING: Except by approval of the inspector, concrete placing shall cease if the temperature of the plastic concrete cannot be maintained at ninety (90) degrees Fahrenheit or lower.

To facilitate the placement of concrete in hot weather, a retarding chemical admixture Type B or D, in conformance with ASTM C-494, may be used

## ITEM 7.0 CONSOLIDATING AND FINISHING

The pavement shall be struck off and consolidated with a mechanical finishing machine, vibrating screed, or by hand-finishing methods. A slipform paver may also be used. When a mechanical finishing machine is used, the concrete shall be struck off at such a height that after consolidation and final finishing, it shall be at the elevation as shown on the plans.

The finishing machine shall be provided with a screed, which will consolidate the concrete by pressure, vibration or both. The concrete shall be brought to a true and even surface, free from rock pockets. The edge of the screeds along the curb line may be notched out to allow for sufficient concrete to form the integral curb. Hand-finishing tools shall be kept available for use in case the finishing machine breaks down.

When hand-finishing is used, the pavement shall be struck off and consolidated by a vibrating screed to the elevation as shown on the plans. When the forward motion of the vibrating screed is stopped, the vibrator shall be shut off; it shall not be allowed to idle on the concrete.

7.1 SCRAPING AND STRAIGHTEDGING: The pavement may be required, by the inspector, where applicable, to be scraped with a straightedge, equipped with handles long enough to permit it to be operated from the edge of the pavement.

When irregularities are discovered, they shall be corrected by adding or removing concrete. All disturbed areas shall be floated with a wooden or metal float not less than three (3) feet long and not less than six (6) inches wide and again straight-edged.

7.2 EDGING: Before final finishing is completed, and before the concrete has taken its initial set, the edges of the slab and curb shall be carefully finished with an edger.

7.3 FINAL SURFACE FINISH: A burlap drag or medium broom shall be used as the final finishing method for concrete pavement. The drag shall be at least three (3) feet in width and long enough to cover the entire pavement width. It

shall be laid on the surface of the pavement and dragged forward in the direction in which the pavement is being laid. If a broom finish is used, the brooming shall be drawn from the center to the edge of pavement using overlapping strokes to produce surface corrugations of uniform appearance about 1/16th inch in depth. The curb shall have the same final finish as the pavement.

The final surface of the concrete pavement and curb shall have a uniform gritty texture, and true to the grades and cross-sections shown on the plans.

#### ITEM 8.0      INTEGRAL CURB

Curbs shall be required along the edges of all street pavement where shown on the plans and shall conform to cross sections. Curbs may be constructed simultaneously with the pavement with extrusion equipment, hand formed immediately after the finishing operation, or built as a separate construction operation.

The integral vertical and rolled curb shall be constructed with or immediately following the finished operation. Special care shall be taken so that the curb construction does not lag the pavement construction and form a "cold joint".

When integral vertical curbs are required along the edges of all street pavement, depressed curbs two (2) inches above gutter line shall be provided at all driveway entrances and at such other locations as designated on the approved plans.

In placing concrete curb, sufficient spading shall be done to secure adequate bond with paving slab and eliminate all voids within and back face of the curb.

Curbs shall be formed to the cross-section in accordance with Appendix "C".

#### ITEM 9.0      CURING

Concrete shall be cured by protecting it against loss of moisture, rapid temperature change, from rain, flowing water, and mechanical injury for a period of not less than five (5) days from the beginning of the curing operation. Moist curing, waterproof paper, white pigmented liquid membrane compound, or a combination thereof, may be used for curing. Immediately after finishing operations have been completed, the entire surface of the newly placed concrete shall be covered by the curing medium which is applicable to local conditions and approved by the inspector.

The edge of concrete slabs exposed by the removal of forms shall be protected immediately to provide these surfaces and to prevent injury to concrete edges.

The covering material shall be kept free of any substances which may be detrimental to the surface of the concrete. The initial curing medium shall be effective and shall be applied so as to prevent checking, cracking, and the appearance of dry spots in the surface of the concrete. The contractor shall have the equipment needed for adequate curing at hand and ready to install before actual concrete placement begins. In all cases in which the curing medium requires the use of water, the curing shall have prior right to all water supply. Failure to provide sufficient cover material of the type selected, failure to maintain saturation for the entire curing period in the moist-curing methods, lack of water to adequately care for both curing and other requirements, or other failures to comply with curing requirements shall be cause for immediate suspension of concreting operations.

9.1 MOIST CURING: Moist curing shall be accomplished by covering of burlap, cotton mats, or other approved fabric mat used singly or in combination.

Curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the pavement surface for the duration of the moist curing period. Other fabric mats shall conform in design and shall provide a curing medium at least equal to cotton mats. Cotton mats, other fabric mats, and burlap mats and burlap strips shall be furnished in the widths or lengths, after shrinkage, required to cover the entire width and edges of the pavement lane. Mats or burlap shall be lapped at joints between adjacent sheets to prevent drying at this location. Moist curing, when used as initial curing, shall be continued for not less than twenty-four (24) hours. Type and weight of cotton mats for curing concrete shall conform to ASTM C-440 or AASHTO M-73. Burlap strips shall conform to AASHTO M-182.

9.2 WATERPROOF PAPER AND POLYTHENE SHEETING CURING: The surface of the concrete shall be wetted with a fine spray of water and then covered with the waterproof paper or sheeting. The paper or sheeting shall be in pieces large enough to cover the entire width and edges of the slab and shall be lapped not less than twelve (12) inches. Paper or sheeting shall be adequately weighted to prevent displacement or billowing due to wind. Paper or sheeting folded down over the side of the pavement widths shall be secured by a continuous bank of earth. Tears or holes appearing in the paper or sheeting during the curing period shall be immediately repaired.

9.3 LIQUID MEMBRANE CURING COMPOUND: Pigmented liquid membrane curing compound shall meet the specifications under ASTM C 309. The curing compound must be applied to cover the surface completely and uniformly at a rate which will achieve the performance requirement specified in AASHTO specifications M 148 or ASTM Designation C 309. This method of curing shall be applied immediately behind the final finishing operation or after

the initial curing when a combination of methods are used. Failure to provide complete and uniform coverage at the required rate will be cause for discontinuance of this method of curing and the substitution of one of the other approved methods. The compound shall be kept agitated to prevent the pigment from settling. Special care shall be taken to apply the curing compound to the pavement edges immediately after the forms have been removed.

#### ITEM 10.0 PAVEMENT JOINTS (all joints shall be constructed as per details in Appendix "C")

Concrete pavement shall include expansion, contraction, and longitudinal joints. Transverse joints may be expansion and contraction type joints which shall be continuous across the pavement lane including the curb. Longitudinal joints are parallel to the pavement lanes. Construction joints are necessary when the placement of concrete is delayed. The location of transverse construction joints may be either planned (coincidental with a contraction joint) or emergency (not coincidental with a contraction joint). In general, the location of longitudinal joints shall be centered between pavement lanes except for street widths 30 feet and wider.

The placement and construction of all pavement joints shall comply with joint details in Appendix "C" and shall be shown or referenced on the Improvements Drawings in accord with the following criteria:

##### 10.1 EXPANSION JOINTS

Expansion joints shall be Type 1. Filler material shall conform to Item 2.7.1 of these regulations and extend the entire width of the pavement. The filler shall be held accurately in place during the placing and finishing of the concrete by a bulkhead, a metal channel cap or other approved method.

Expansion joints shall be installed at the following locations: (1) at all street intersections at the point of curvature of the turning radii entering the intersection; and (2) at cul-de-sacs or turnarounds at the point of curvature of the first turning radii approaching the turn-around. In no case shall the expansion joint spacing exceed 300 feet.

No concrete shall be left above the expansion material or across the joint at any point. Any concrete spanning the ends of the joint next to the forms shall be carefully cut away after the forms are removed.

Before the pavement is opened to traffic, the groove above the filler shall be cleaned and sealed with joint sealing material specified in Item 2.7.2 of these regulations.

## 10.2 CONTRACTION JOINTS

Transverse contraction joints shall be Type 2. They may be sawed or grooved with a metal jointing tool, equal to a depth of one-fourth (1/4) of the pavement thickness. If the pavement is grooved with a metal jointing tool, special care should be taken to prevent surface irregularities at the joint location.

In no case shall the contraction joint be spaced at intervals greater than a distance of fifteen (15) feet between joints.

If sawed joints are specified, they shall be sawed within a time frame of between four (4) hours and eight (8) hours following placement of each pavement section. However, depending upon temperature, weather conditions, and other factors affecting setting times, variations to these time frames may be required to ensure that joints are sawed early enough to control cracking, but late enough to prevent any damage by blade action to the slab surface and to the concrete immediately adjacent to the joint.

## 10.3 CONSTRUCTION JOINTS

Transverse construction joints shall be used wherever the placing of concrete is suspended for more than thirty (30) minutes. A transverse construction joint shall be Type 3, with smooth bars if the joint occurs at the location of a contraction joint. A transverse construction joint shall be Type 4 with deformed tie bars if the joint occurs at any other location.

## 10.4 LONGITUDINAL JOINTS

Longitudinal joints between lanes shall be Type 6 of the tied construction type. An alternative longitudinal joint Type 7 may be used with slip-form paving operations. The location of longitudinal joints shall be centered between pavement lanes and coincide with lane markings wherever possible, except for street widths of thirty (30) feet and wider where joints shall be located at equal intermediate locations. In these cases, longitudinal joints may be sawed and shall be Type 5.

## 10.5 INTEGRAL CURB JOINTS

In the construction of transverse joints, special care must be taken to ensure that all transverse joints extend continuously through the pavement and curb.

## ITEM 11.0 TIE BARS

All tie bar reinforcement for concrete pavement shall conform to Item 2.6 of these regulations. All tie bars shall be deformed bars for Types 4, 5, 6, and 7, and plain or smooth bars for Type 1 and 3, as detailed in Appendix "C".

## ITEM 12.0 JOINT SEALER

Pavement joint sealer shall be as specified in Item 2.7.2 of these regulations. Application of joint sealer shall be as follows:

Material must be melted in a double boiler, oil jacketed melter equipped with a mechanical agitator, pump, gas pressure gauges, and separate temperature thermometers for both oil bath and melting vat, with accessible control valves and gauges.

On start up of melter, raise the oil bath temperature, not to exceed 450 degrees (F). Add small quantities of crack filler material to the melter and, while continuously agitating, add additional material as needed. Control material temperature at 380 degrees (F). Do not exceed 400 degrees (F) at start up.

The sealing and filling of joints and/or cracks may be done at air temperature of 40 degrees (F) or higher. For best results, cracks should be filled to a depth of 1/4 inch below the surface. Where necessary to limit the depth of the sealant, use cotton or kraft rope inserted to the correct depth of the cleaned joint or crack.

Small quantities of unused material remaining in the melter may be remelted and used the following day.

## ITEM 13.0 STRUCTURES ENCOUNTERED IN THE PAVED AREA

13.1 MANHOLES AND CATCH BASINS: All manholes and catch basins encountered in the areas to be paved shall be raised or lowered to the surface of the new pavement. Catch basins may be separated from the pavement and curb by boxing out around basin. See Appendix "C".

## ITEM 14.0 PROTECTION AND OPENING TO TRAFFIC

Traffic shall be excluded from the pavement by erecting and maintaining barricades and signs until the concrete is at least fourteen (14) days old or has attained a compressive strength of 3,500 pounds per square inch and/or 550 pounds per square inch flexural strength. This traffic restriction shall apply to the contractor's construction equipment and vehicles, as well as general traffic. As soon as curing and sealing are completed, the contractor shall clean up the pavement free from all debris.

## ITEM 15.0 CURB, GUTTER, SIDEWALK, AND DRIVEWAYS

Construction of curb, gutter, sidewalk, and driveways shall require the same care as the street pavement. The preceding requirements shall apply, where pertinent, to the construction of curb, gutter, sidewalks, and driveways within the right-of-way. In addition, sidewalks or driveways shall be constructed so that the transverse joint spacing shall be equal to the width of the sidewalk or driveway, but in no case shall the transverse joint spacing for driveways exceed twelve (12) feet and not greater than five (5) feet for sidewalk spacing. Sidewalks and driveways, within the right-of-way, shall be constructed with a pavement thickness of at least four (4) inches and increased to five (5) inches when included as a part of a driveway. Driveways shall be a minimum of five (5) inches in thickness within the right-of-way. (see Appendix "C" for typical section details). Commercial and industrial entrances will require sidewalk thickness conforming to driveway pavement thickness.

## ITEM 16.0 PAVEMENT THICKNESS

Pavement thickness for each type street classification shall be as provided in Table A-1. Streets that are subjected to exceptionally heavy truck traffic shall require a more complete detailed analysis by the subdivider's engineer and approved by the planning commission's engineer.

All arterial streets shall be designed in accordance with the requirements of the Kentucky Department of Transportation. A-16

**16.1 TOLERANCE IN PAVEMENT THICKNESS:** Deficiency in pavement thickness determined by drilling or coring new concrete pavement shall not exceed 0.20 inches. When thickness of pavement is deficient by more than 0.20 inches, such areas shall be removed and/or replaced unless otherwise determined by the inspector and a qualified registered professional engineer.

**16.2 SURFACE TOLERANCE:** The finished surface shall be tested for smoothness by use of a 10-foot long straightedge placed parallel to the centerline of the pavement in each wheel lane. Ordinates measured from the face of the straightedge to the surface of the pavement shall at no place exceed one-quarter inch. Areas that do not meet the required surface accuracy shall be clearly marked out and the Contractor shall, at his own expense, as required by the planning commission's engineer:

1. Grind down any areas higher than 1/4 inch but not more than 1/2 inch above the correct surface.
2. Correct any areas lower than 1/4 inch but not lower than 1/2 inch below the correct surface by grinding down the adjacent areas.



3. When the deviation exceeds 1/2 inch from the correct surface, the pavement slab shall be broken out and replaced for a length, width and depth which will allow the formation of a new slab of the required quality in no way inferior to the adjacent undisturbed slab.

#### ITEM 17 PAVEMENT THICKNESS MEASUREMENTS

Pavement thickness for each type street classification shall be as provided in Table 3. Streets that are subjected to exceptionally heavy truck traffic shall require a more complete detailed analysis by the subdivider's engineer and approved the Planning Commission.

Upon completing of the base, cores shall be taken at approximately 300 foot intervals alternating lanes, to determine pavement thickness. On streets less than 600 feet in length, a minimum of three (3) pavement cores shall be taken. A deviation of the specified thickness of 0.2 inches shall be tolerable. When the pavement thickness is less than the allowable deviation, additional pavement cores shall be taken at 25 foot intervals ahead, behind and across, until the specified thickness has been measured.

When the pavement thickness is less than the specified allowable deviation the developer shall have the following options:

1. Remove the pavement, retest the subgrade and replace the pavement to proper thickness.
2. After having satisfied all other County specifications pertaining to pavement construction (i.e., fill density testing, subgrade testing, etc.), the developer shall by the appropriate Legislative body a porting to the contact price. The contract price will be figured using the given variables below. This is similar to the procedure set forth in Section 501.28 of the Kentucky Transportation Cabinet's "Standard Specifications for Road and Bridge Construction, 1991 Edition".

When determining average contract price, the minimum deficient area to be used will be 50 linear feet, each lane being separate.

### PAVEMENT DEFICIENCY

Deficiency in Thickness Determined by Cross (Inches)	Proportional Part of Contract Price Due to Appropriate Legislative Body
0.00" to 0.20"	0%
0.21" to 0.30"	20%
0.31" to 0.40"	40%
0.41" to 0.50"	60%
0.51" to 0.75"	80%
0.76" to 1.00"	100%

The minimum thickness allowed under this option is as follows:

<u>Designed Depth</u>	<u>Minimum Thickness</u>
7.0"	6.0"
8.0"	7.0"
9.0"	8.0"
10.0"	9.0"

Any pavement that has a thickness deficiency of more than 1" deviation will have to be replace, as stated in Option #1.

TABLE A-1  
MINIMUM PAVEMENT THICKNESS FOR  
STREETS - PORTLAND CEMENT CONCRETE\*

STREET CLASSIFICATION	PAVEMENT THICKNESS (INCHES)
LOCAL STREETS INCLUDING COURTS AND CUL-DE-SACS (serving 50 lots or less)	7
SUBCOLLECTOR OR LOCAL STREETS (serving more than 50 lots)	8
COLLECTOR	9

\*Streets shall be designed in accord with the typical street section details in Appendix "C".

\*\* Where streets are to serve industrial or commercial areas, the pavement design shall be based on a study prepared by the subdivider's engineer projecting the type of vehicles using the street and traffic volumes approved by the planning commission's duly authorized representative.

Note: Welded wire fabric or wire mesh for reinforcing concrete pavements shall not be required unless otherwise specified by the design engineer.